Economics of the Public Sector
MIDTERM EXAM
Spring 2001

Instructor: Anna Rubinchik-Pessach

October 13, 2002

*Please, be brief and concise in explaining your answer.* Good luck!
1  (20%) Government Spending Programs.

Choose 1 out of 2 statements. Please, explain your answer.¹

1. a Would a “fully funded” or a “pay-as-you-go” system of Social Security be more affected by an increase in the ratio of older population to the working population? (Analyze the effect on the Social Security taxes, benefits to wage ratio and total savings.)

   answer

   Under “pay-as you-go-system” the increase in the ratio of old to young it will be necessary to either increase the taxes on the current working population or to decrease the benefits to wage ratio for the retirees. Under a “fully-funded” system the retirees will just get their savings ”back”, taxes and benefits being unaffected by the increase. Savings are higher under a “fully-funded” system: retirement savings are invested (possibly in T-bonds) under this system, as opposed to the “pay-as-you-go” system, where the Social Security taxes paid by the young are being transferred to the old.

1. b One of your friends cites “The Economist”: “Carbon-dioxide emissions are causing the planet to warm. The best estimates are that the temperature will rise by some 2°-3°C in this century, causing considerable problems, almost exclusively in the development world, at a total cost of $5,000 billion”. Therefore, he said, these emissions should be outlawed. What would have been your answer?²

   answer

   In order to answer this question you have to look at the COST of decreasing or eliminating the emissions. Moreover, one has to consider alternative use of the funds. Is it possible to use the same amount to make the population of Earth to adapt to the new climate by providing assistance to the countries most affected by the global warming (including medical and technological assistance)?

   In short, costs and, more, importantly, alternative costs are important for making this decision. (See ”The Economist” from August 4th 2001, pp.63-65 for more details.)

¹Your grade will be based on the quality of your explanation and not on your views.
²After the exam you may want to consult ”The Economist” from August 4th 2001, pp.63-65, where this problem is discussed.
2  (40%) Your favorite: Job Search and Unemployment Insurance

A person can receive 2 job offers
- $20,000 with probability 1/3
- $30,000 with probability 1/3
- $40,000 with probability 1/3

Once he accepts the job, he is assured to stay there for the rest of his infinite life.

Assume that the search cost for the offers is zero (offers just “fall from the sky”).

If he rejects the offer, then he gets unemployment insurance \(b\) for an unlimited period of time.

Discount rate is \(\beta = .95\)

a. (15%) What is the value of unemployment benefit \(b\) that will make the individual indifferent between accepting the second highest offer (30,000) and rejecting it?

answer

The value of staying unemployed is \(b + \beta E(v(w))\)

The value of accepting the offer is \(v(30,000)\).

The two should be equal, as the worker is indifferent between accepting and rejecting the offer. Therefore, the unemployment compensation, \(b\) is

\[
b = v(30,000) - \beta E(v(w)) = \frac{30000}{1 - \beta} - \beta \frac{30000}{1 - \beta} = 30000
\]  

(1)

b. (15%) Assume that the individual becomes more pessimistic, so that he believes that the likelihood of the offers changed to the following:

- $20,000 with probability \(\frac{5}{12}\)
- $30,000 with probability 1/3
- $40,000 with probability 1/4

Assume that he gets the same unemployment compensation as the one you calculated in a. Will he be indifferent between the second highest offer and staying unemployed? Will he accept the second highest offer now?

answer
First, let’s calculate the new expected value of the offers:

\[
E(v(w)) = \left( \frac{5}{12} * 2 + 3/3 + 4/4 \right) * \frac{10,000}{1 - \beta} = \frac{1}{1 - \beta} * 28,333 \frac{1}{3} \quad (2)
\]

This is less than before (in part a this value was \( \frac{30,000}{1 - \beta} \)).

As expected offers are less valuable, it is less worthwhile to stay unemployed, so the worker will accept more offers.

More precisely, if \( b = 30,000 \) as before, then the worker now will for sure accept the middle offer:

The value of staying unemployed is

\[
30000 + \frac{1}{1 - .95} * 28333 \frac{1}{3} = 596,670 \quad (3)
\]

whereas the value of accepting the offer is \( \frac{30000}{1 - .95} = 600,000 \).

596,670 < 600,000 and so the individual will accept the offer for sure. He will not be indifferent between staying unemployed and accepting the offer.

(10%) Assume that all the workers in the economy are identical to the one described below. Assume that, having realized that the economy is, indeed, in recession, they all became more pessimistic about the job offers, so that they start to believe that the distribution of the offers is as described in question b, rather than that in a. Assume also that the unemployment compensation (b) for all the workers stayed the same (say, at the level calculated in question a.). What will be your prediction about the level of unemployment: will it rise, drop or stay the same as the workers become more pessimistic?

answer.

Assume that the number of workers is very large (large enough to meaningfully apply the law of large numbers).

We saw, that as the workers become more pessimistic, they accept a bigger range of offers (they will for sure accept the two upper offers.)

Now the question is what is a “true” distribution of offers.

If it is the one that is described in a, then the unemployment will be roughly 1/3. It will be lower than in part a if in that situation individuals rejected the second highest offer (being indifferent between accepting and staying unemployed): 1/3 < 2/3 or the same, if they accepted it.

If the “true” distribution is the one described in b, then roughly 5/12 of the individuals will be unemployed. It will be lower than in part a if in
that situation individuals rejected the second highest offer (being indifferent between accepting and staying unemployed): $5/12 < 2/3$ or the higher, if they accepted it: $5/12 > 1/3$.

3  

(40%) Where to live?

Smith loves dogs and has a pair of West Highland terriers. Jones has an incredible fear of dogs and cannot stand to be within sight of them. Smith and Jones are deciding where to live: in Arlington or in Bexley. If they end up living in the same part of town, Jones will run into Smith out walking the Westies and get frightened (he loses 50 in utility terms from living in the same part of town where the dogs are). Jones prefers to live in Bexley (he gets utility 80 from doing so) to life in Arlington (there he gets only 50 in utility terms). Smith, also likes Bexley (his utility there is 90) as opposed to Arlington (where he gets only 80).

a.  

(10%) Describe the situation as a normal (strategic) form game.

answer

Let Jones be the row player. His payoff is the first in the pair.

<table>
<thead>
<tr>
<th>Jones\Smith</th>
<th>Arlington</th>
<th>Bexley</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arlington</td>
<td>0, 80</td>
<td>50, 90</td>
</tr>
<tr>
<td>Bexley</td>
<td>80, 80</td>
<td>30, 90</td>
</tr>
</tbody>
</table>
b. (15%) Assume they decide independently on where to live. Find Nash equilibria of the game. Describe the outcome.

answer.
Smith will choose to live in Bexley (he prefers it, no matter what Jones does). But then Jones will choose Arlington.

c. (15%) Assume they can negotiate before making the decision and make payments to each other. Will the outcome change? Who will be compensated in this case?

answer
Jones could try to convince Smith to move to Arlington. Assume that the payoffs are comparable. Then Jones will be ready to compensate Smith to move to Arlington. (If the utility from leaving in a certain location is expressed in monetary terms, Jones will be ready to pay to Smith up to 30 = 80 − 50 and Smith will be ready to accept anything above 10 = 90 − 80). Then Jones can live in Bexley.